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## INVESTIGATING OPENNESS OF THE CULTURAL LANDSCAPE: A METHODOLOGICAL PROPOSAL

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### Abstract

Openness and closure, understood as a physiognomic property of landscape, characterises the possibility of observing far out horizons and broad vistas. The degree of openness of landscape can be treated as a synthetic indicator of the evolution of the natural-cultural environment. A change in the degree of openness / closure of landscape is a lengthy historical-cultural process, lasting hundreds or even thousands of years. It has different course and dynamics in various climatic and vegetation zones. The purpose of the present article is to propose and describe a method of assessment and interpretation of the degree of actual openness of the cultural landscape and to discuss the results obtained, and of comparing the methodology proposed with analogous European elaborates. The average percentage of openness of landscape was assessed according to five classes. The source base for the study was constituted by the satellite images, Corine Land Cover maps, made legible through comparison with the land use maps presenting the state as of the turn of the 21st century. The method here proposed allows for the assessment of the continuous variability of landscapes, expressing the gradient from open to closed landscapes.

### Key words

landscape physiognomy • indicator of openness • closure of landscape • Poland

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### Introduction

In the world literature the considerations dominate concerning the opening up of the landscapes in connection with the felling of the equatorial forests and

the global consequences of this activity. The opposite processes – those of closing of the landscapes – which dominate nowadays in the countries of Central and Eastern Europe, are perceived much less frequently.

The analysis of the degree of openness / closure of landscape as the expression of spatial differentiation of the physiognomic qualities is a recurring subject of study. Currently, this domain of study has become important in view of the need for a rational and sustainable management of cultural landscapes. Implementation of the European Landscape Convention requires the adjustment of regulations in the domain of landscape policy, that is – planning, managing and protecting the landscapes. In Poland it is also necessary to broaden the investigations devoted to landscapes by the issues related to cultural landscapes.

Assessment of the aesthetic qualities of landscape, and the degree of its openness or closure were the subject of numerous studies in the fields of geography and geoecology. The respective issues appeared most frequently in the French literature, starting with Vidal de la Blache (1908, 1922), and then in the works of Brossard and Wieber (1984), Cabouret (1984), Solle (1984), Brossard and Joly (1988, 1996), or Perigord (1996), while in the English language literature – in, for instance, the studies of Meeus (1993, 1995), Miller and Law (1997). In Poland, the scientific foundations for the aesthetic stream in the assessment of landscape were laid primarily by the town planners, landscape architects and theoreticians of gardening. The subject of analyses, conducted increasingly often with the use of digital techniques, is constituted, in particular, by view reaches, number of plans, vertical and horizontal composition, colour differentiation, contrast of colours and shapes (Wejchert 1993; Ozimek & Łabędź 2010; Ozimek et al. 2010). Likewise, cultural landscapes were analysed as developed in various historical periods and with various architectural styles (Małachowicz 1994).

The detailed considerations and architectural designs have a large-scale character and are meant for utilitarian purposes (Smardon et al. 1986; Jakle 1987; Bell 1999; Motloch 2001 and, in Poland: Bogdanowski 1976, 1998; Królikowski 1999; Böhm 2006). Such analyses were increasingly often the

subject of interest from the side of geographers (Chmielewski 2012), especially with respect to the issue of perception and aesthetic assessment of landscape (Wojciechowski 1986, 2007; Szewczuk 1995; Śleszyński 1998, 2007; Rogowski 2009).

In the recent years the traditional methods of cartographic analysis have been enriched and perfected through application of the computer based techniques of analysis and numerical modelling (Miller & Law 1997; Śleszyński 1998, 2007; Nita & Myga-Piątek 2014). The issue of visibility of landscape was considered by Ervin and Steinitz (2003), and Bishop (2003). The questions of landscape typology with respect to the nature of the land cover were taken up and elaborated by, in particular, Smardon et al. (1986), Jakle (1987), Meeus (1993, 1995), Bell (1999), Motloch (2001). The purpose of the present article is to propose and describe a method of assessment and interpretation of the degree of actual openness of the cultural landscape of Poland, to elaborate a map, presenting the contemporary openness of landscape and to discuss the results obtained. Besides, the authors undertook the task of critical evaluation of the classifications of open and close landscapes, proposed to date, and of comparing the methodology proposed with analogous European elaborates.

### **Object of study: Open and closed landscape. Discussion of meanings**

Openness and closure, understood as a physiognomic property of landscape, characterises the possibility of observing far out horizons and broad vistas. The degree of openness of landscape can be treated as a synthetic indicator of the evolution of the natural-cultural environment. When considering the form of the landscape as the result of natural and anthropogenic processes, it becomes important to analyse the proportions between the elements of natural and cultural origin. The architectural-planning approach and the

historical-conservatory approach distinguish various kinds (forms), depending upon the domination of the particular components. In this typology three types of landscapes are distinguished: 'urbanised', 'open' and 'green'. According to Małachowicz (1994: 452): "(...) urbanised landscapes comprise all types of landscapes, whose cover is constituted by the structures of fully urban character, or which are in their architectural forms similar to the urban ones." Within the framework of this notion the composition groups are distinguished (historical centres, complexes dating from the period of historicism, and contemporary cities). Additionally, due to the extension of towns and suburban settlements the 'urbanising' landscape type is also distinguished. In this approach the 'urbanised' landscapes are, in fact, synonymic with the 'closed' landscapes.

Thus, the 'open' type is represented in this approach first of all by the rural, agricultural areas, sometimes also the protected areas – like, for instance, national parks, landscape parks, and zones of protected landscape (Bogdanowski 1976, 1998). Each of these landscapes contains a certain resource and features of the particular forms, being some kind of determinants, decisive for the basic character of a given fragment of space. That is why in the framework of the 'open' type, depending upon the needs related to the degree of detail of the study, further varieties are distinguished (like protected landscapes, national parks, etc.). 'Open' landscape, in the architectural approach, constitutes "(...) the landscape of agricultural crops, waters, gardens, meadows and pastures, the settlement pattern in the form of villages and the roads linking them (...)" (Małachowicz 1994: 468). Assessment of aesthetic qualities according to this approach is conducted in Poland most frequently conform to the concept of 'landscape interiors' and 'architectural-landscape units', as proposed by Bogdanowski (1983, 1998).

The third landscape type, which is distinguished in the historical-conservatory typology, is the 'green' landscape, having as "(...)

basic components earth, water, greenery, and air" (Małachowicz 1994: 477). Additionally, in this typology the architects often refer to the composition of landscape, distinguishing the 'composed' landscapes (gardens, parks, palace-and-park compounds, etc.), as well as the degree and proportion of appearance of the desired qualities of spatial organisation, e.g. 'harmonious' or 'disharmonious' cultural landscapes (Bogdanowski 1983, 1998; Janecki 2008).

In the opinion of the present authors such distinction does not fulfil the criteria of formal logic: the respective divisions (classifications) are neither disjoint nor exhaustive. In this way a number of methodological and typological doubts arise, namely cannot an 'open' landscape in Europe be at the same time 'green'? or – is it justified to include in the 'open' landscapes national and landscape parks, which are in Europe primarily forest areas?

It was decided to analyse in the present paper the issue of openness / closure of landscapes in a synthetic manner, and that is why the survey scale of around 1:4,000,000 was selected. The basis for analysis was assumed to be constituted uniquely by the physiognomic criteria, irrespective of whether the assessment is performed of the landscape components of natural or anthropogenic origin. In the geographical typology proposed below, the 'open' landscape is considered to be the one that is not obstructed by forests, trees, or orchards, and also the landscape of the not-overbuilt areas. Hence, the 'open' landscape is in a vast majority of cases constituted by the areas of cultivated fields, pastures, wetlands, peat bogs and natural meadows. The 'closed' landscape is formed by forests, parks, orchards, compact settlement structures (like large villages and urbanised areas), as well as industrial and mining areas. A change in the degree of openness / closure of landscape is a lengthy historical-cultural process, lasting hundreds or even thousands of years. It has different course and dynamics in various climatic and vegetation zones. It results from the human activity – the growth of the settlement system and

the development for economic use of a given area (Plit 2011; Myga-Piątek 2012; Plit & Myga-Piątek 2014). This process displays fluctuations, depends upon the population number inhabiting a given area, technological advancement, ways of economic management, historical events, and numerous other factors. It is also conditioned by the natural processes, such as volcanic eruptions, earthquakes, climatic changes, catastrophic floods or prolonged droughts, windbreaks, fires, mass pest invasions, or epidemics.

### **The method of study and the source materials**

The source base for the study was constituted by the google maps, Corine Land Cover maps, made legible through comparison with the topographic map (1:100,000; 1:50,000). For a part of the territory of south Poland (approximately 20%) orthophotomaps 1:26,000 (1996-2002) also were used. The latter material served to verify the method and to check the precision of the degree of land coverage. The photographic and cartographic material did not originate, alas, from the same time period. There were roughly 10 years of delay between the particular materials, and for this reason the map here presented cannot be precisely dated (Plit & Myga-Piątek 2014:147).

The following initial assumptions were made for the analyses:

1. The degree of openness / closure of the landscape was considered from the point of view of a human observer, standing on the ground, 140-190 cm tall. It can be admitted that this interval of height accounts also for the possibility of observation by the cyclists. Every change in this interval brings the consequences in terms of shorter or longer range of vision (Plit & Myga-Piątek 2014: 147).

2. The assessment and calculation of the degree of openness / closure of landscape took place during the growing season, when trees and bushes have leaves. The investigations were carried out under average visibility conditions, with exclusion of days with

extreme weather, that is – the rainy and foggy days (horizon being made invisible by precipitation or fog), as well as the days with extremely good visibility (like, e.g., after the passage of a cold front), when the sharpness and range of vision are enhanced by the clarity of the air.

3. For purposes of simplification of the methodology, the factor of vertical differentiation of relief was neglected. Since the lowland plain relief dominates decidedly over the territory of Poland, it was deemed purposeless to use as the basis for analysis the digital terrain model. In the course of field observations the range of the field of visual penetration was verified, this range changing in the function of differentiation of surface relief. On the plains, where horizon is visible, the radius of visibility is equal to 1.5-3.5 km, in the undulating areas, where hills form the horizon, or in case there is a tall characteristic structure, this radius may even reach 7 km. On the other hand, from single hills, or chains of hills, one can observe elevated points and mountains at the distance of several dozen kilometres, sometimes even up to or beyond 100 km.

4. The proposed classification method states the approximate results – approximate because it is envisaged for small-scale or reference maps.

In order to calibrate the method, test observations were carried out. The possible field of visual penetration was identified and registered on the maps on the scale of 1:100,000:

- a. from a number of observation points the field of vision was registered in all directions;
- b. along the segments of roads of several tens of kilometres in various parts of Poland the image perpendicular to the road was registered.

Afterwards, colours were used to mark along the roads the segments of the same degree of openness / closure of landscape. The lengths of segments, belonging to the same classes were summed up. Field observations were compared with the image on the map and the satellite images, extrapolating

the direct measurement results over bigger areas. The feature analysed has the character of a continuous variable in space, one can only establish the gradients of passage from the open to closed landscapes. Average values of the degree of openness / closure in large regions were calculated. The values, expressed in percent, were presented on the map in five class intervals.

Although this was possible from the methodological point of view, the existing physico-geographical regionalisations were not made use of as the basis for the investigations (like those of Kondracki 1977; Olędzki 2007). Use was also not made of the bio-geographical regionalisation systems, nor of the administrative division of the country. Likewise, division of the territory into homogeneous geometric grid was not applied, since, even if objective, such a division would not be natural. In the division adopted attempt was made of avoiding the influence from the course of boundaries of spatial units delimited for other purposes, and of avoiding divisions of the homogeneous areas. The intention of the authors was to “sharpen” the characteristics of the basic units and identify their regional differentiation. When analysing the maps and photographs, the territory of Poland was broken down in terms of the degree of openness / closure of the landscape, with distinction of large, relatively homotonic areas. It is possible to distinguish on the source materials compact homogeneous areas, having distinct belt-like pattern, and those of small scale mosaic character. In the particular parts of the country various features are decisive for the obstruction of the perspective. When defining the regions, account was taken not only of the percentage shares, but also of the manner of ordering of patches, internal structure and texture of landscape (visible on the maps and on the photographs).

## The results

It was observed that nowadays the factors closing the landscape (obstructing the view of the horizon) are: forests (both mature

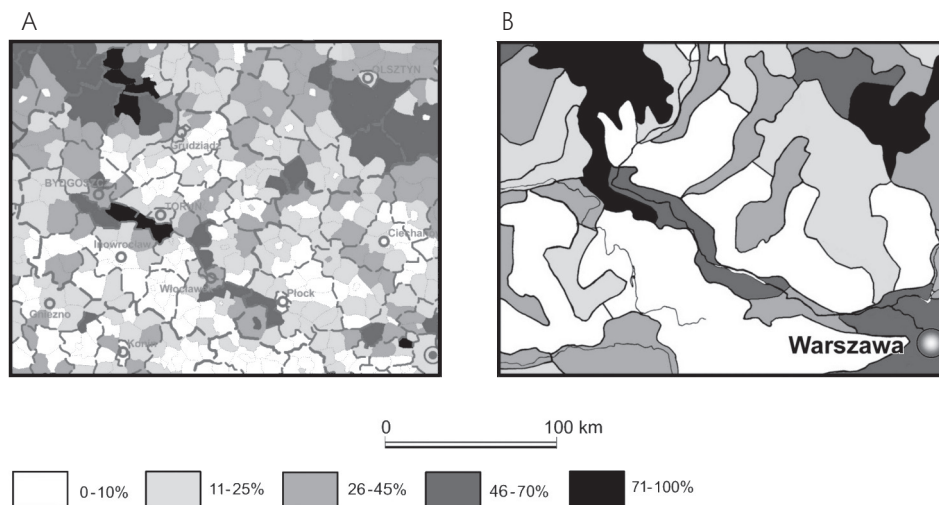
stands and young groves), tall bushes (like floodplain osieries or mountain dwarf pine fields), plantations of wicker, aronia, hazel, and hops, orchards, parks, areas of compact buildings (housing and industrial or storage, as well as service), but also dispersed buildings, characteristic for the suburban areas. It was established through field studies that the small-scale mosaic landscape structure with numerous small patches of groves and bushes, which obstruct the vision, despite the small forest share indicator, involves a significant degree of closure of landscape.

The average percentage of openness of landscape was assessed according to five classes. Data originating from the National Census of 2010 were used for verification of the course of boundaries of the regions and for potential modification of the assessment of the degree of openness / closure. In the smallest administrative units the percentage shares in their areas were calculated of forests, orchards, and the permanent plantations of tall bushes, and the synthetic comprehensive map was elaborated (fragment A in Fig. 1) (Plit & Myga-Piątek 2014: 147).

As we compare the fragments A and B of Figure 1, we can see a high similarity of patterns on both maps. Attention is especially attracted to the fact that delimitation of the boundaries of units conform to the actual reaches leads to the sharpening of characteristics of the neighbouring regions. The cartogram shows the typological image (intermixed elements of the mosaic), while the map of the landscape openness / closure indicator values shows the regional image. The current degree of openness of the Polish cultural landscapes is documented with the map (Fig. 2).

The analyses performed allowed for the distinction of five physiognomic types of Polish landscapes, taking into account the criterion of proportion of openness / closure of the landscape:

Type A – ‘open’ landscapes (classification A-E based on Plit & Myga-Piątek 2014:148-149): constituted by the farming areas (mainly cultivated fields), where the percentage of visual obstruction does not exceed 10%.



**Figure 1.** A case study. A. Percentage shares of forests, orchards and permanent plantations of bushes in the areas of municipalities in 2010; B. The values of the landscape openness / closure indicator calculated in the regions, accounting also for the share of urbanised areas (the calculations and the map were made by P. Śleszyński).

Type B – ‘almost open’ landscapes, which are the agricultural, pasture and field areas with a low share of groves and small woods, where the percentage of visual obstruction is 11-25%.

Type C – ‘semi-open’ landscapes are the agricultural pasture areas, where the structure of landscape is mosaic-like, and numerous fallow areas are spontaneously overgrown with woods and bushes. The degree of visual obstruction is contained between 26% and 50%.

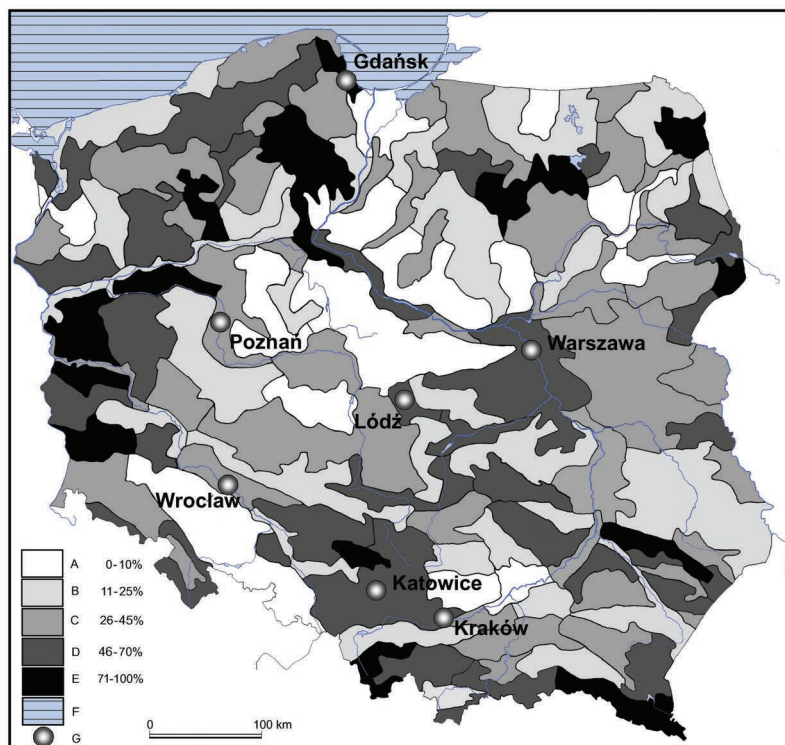
Type D – landscapes that are ‘to a high extent closed’, since the percentage of closure amounts to 51-75%. These are the areas, where horizon is covered by high structures, tall trees and convex forms of the relief. On the majority of areas in this group all the elements covering the horizon neighbour one upon another, or even overlap. The tendency is also observed of further closing of the landscape.

Type E – ‘closed’ landscapes – the areas, where horizon is covered in at least 76% by tall vegetation, relief forms or compact buildings. These are the areas of compact forest complexes, or cities and industrial areas, surrounded by important forest complexes.

Spatial distribution of the types distinguished across the territory of Poland displays a certain degree of ordering. One can distinguish a broad belt of the ‘closed’ landscapes (type E) and ‘to a high extent closed’ landscapes (type D), stretching along the western boundary of Poland, and two parallel broad belts, at a distance one from another, stretching along the Baltic coast and along the proglacial valleys of Noteć and Warta rivers. The closed landscapes are formed there by the large scale compact forest complexes and the agglomerations of the Tri-City (Gdańsk, Sopot, Gdynia) and Szczecin. The process of closing of landscapes in this entire region started in the 17th century, as the effect of depopulation due to the Thirty Years War, and got intensified after the World War II (Plit 2009). Nowadays, the islands of the open landscapes are constituted by the wetlands and boggy valleys of Warta, Noteć, and Odra rivers, and the area of Żuławy, the delta of Vistula, drained and used for farming purposes.

Elongated belts of closed landscapes are encountered in the mountains (mainly in the Carpathians, but also in Sudety Mts., and





**Figure 2.** Contemporary degree of openness / closure of Polish landscapes. A. Open landscapes; B. Landscapes almost open; C. Semi-open landscapes; D. Landscapes closed to a high extent; E. Closed landscapes; F. Sea; G. Large cities.

in Świętokrzyskie Mts.). In these regions landscape is obscured by the forests. Forested area has been distinctly increasing since the World War II<sup>1</sup>. An especially fast and large-scale increase has been observed in the eastern part of the Polish Carpathians, caused by the deportation of the Ukrainian, Łemko and Bojko populations during and immediately after the war. The second reason of the increase of forest area in the mountains is the decline of shepherding and abandonment of cultivation on difficult plots (Plit 2004).

The central part of Poland is constituted by the landscapes that are open or open

to high extent. These are the territories, which have been for centuries used for farming, and their relief is little diversified.

Between lower Narew river and the upper courses of Vistula and Odra a belt of landscapes stretches which are to a high extent closed. This area is densely populated, urbanised and industrialised (regions of Warsaw, Łódź, Kraków and Upper Silesia). Urban agglomerations are accompanied by the large-surface orchards and forest complexes, being the places of recreation (situated mainly along the rivers).

A specific situation exists in the eastern and southern parts of Poland. These are the areas of the traditional, small-scale farming. High degree of landscape closure in this region results not so much from the high share of forests, orchards and urbanised areas, as from the small-scale mosaic

<sup>1</sup> In the 1980s and 1990s, on the territory of Sudety Mts., due to the ecological catastrophe (air pollution and acid rains) many tree stands were damaged or destroyed. The respective areas were reclaimed and forests were re-established, with a somewhat modified specie composition of the stands.



landscape structure, and spontaneous overgrowing of the abandoned agricultural plots.

## Discussion of results

### Natural conditioning

In view of the domination of the Polish landscapes by vast plains and low uplands with undulating hilly relief, it was expected that the territory of the country should be potentially characterised by the 'open' landscapes. Relief was evened out in the periglacial period, the fluvio-glacial forms (large outwash fields, kames and eskers), as well as wide pro-glacial valleys, all have mild shapes and do not cover the vistas. More differentiated relief, with bigger altitude differences, exists on the area of the Baltic glacial period moraine area. Along the southern edge of the country low and medium high ranges of Sudety Mts. and the Carpathians are situated – and there, due to relief, wide horizon is either uncovered (when observed from the elevated points) or covered, in the valleys, by the surrounding eminences.

On the other hand, Poland, being located in the zone of moderate transitory climate, represents the landscape zone of mixed and deciduous forests. Location in this climatic-and-vegetation zone determined the character of the natural landscapes of Poland as originally 'closed'. Except for the water bodies almost whole territory of the country was covered by forests. Fragments of the 'open' landscapes existed solely within the reaches of wetland habitats and swamps (shores of rivers and lakes, overgrowing lake bowls and melt-out pots, river deltas), dominated by peat-bogs, swards and reeds, as well as smallish enclaves of moorlands and xerothermic grasslands. Open were also the landscapes of mountains above the forest line, i.e. within the floor of Alpine type of vegetation of mountain meadows and rocks. All in all, at around the 10th century, when Poland entered the historical stage, the 'open' areas, not wooded in a natural manner, occupied altogether only few percent of the country territory.

Locally, the degree of closure of the landscape has been undergoing changes many times over, owing to the action of natural factors. Periodically, the floodplain vegetation in the river valleys was destroyed by floods. The crowberry pine forests along the Baltic Sea coast were subject to destruction by stormy winds and moving dunes. Fires and windbreaks destroyed forests. In the mountains – avalanches would wipe out significant areas of mountain woods. In the course of natural succession the resulting clearings have been overgrowing with forest again. If the process of elimination of the forest systematically recurred in the same locations, then the respective forests would change their structure, e.g., in the willow-and-poplar floodplain woods the density of trees would undergo a natural thinning or the trees would be (partly) replaced by the bushy vegetation – osiers, wickers, or even riverside meadows.

### Discussion of the criteria

The present study is an attempt at continuation and complementing of the earlier works, concerning similar subject matter. The typology of landscapes on the European scale, elaborated by Meeus (1993, 1995), presents, out of necessity, a simplified image – due to the scale adopted, i.e. 1:25,000,000. In identification of the European landscapes the author mentioned considered six grouped criteria, namely geological and climatic zones, economic potential of the land used (agriculture and forestry), methods of land use (sustainable land management), degree of naturalness of landscapes, presence of the traditional patterns of agricultural use (mainly the setting of fields), the types and forms of traditional settlement developments, as well as the openness of landscape as the visual effect of action of the natural and anthropogenic processes (Meeus 1995: 61-62). On the map, presented by this author, and in the described physiognomic typology of the cultural landscapes of Europe, the influence was not accounted for of the urbanised, mining and industrial areas. An increasing pressure

from urbanisation is observed in the contemporary cultural landscape, and so neglecting this factor appears to be improper and calling for the respective complement.

The areas featuring visual obstruction in more than 70% were considered as closed. This threshold, is, of course, arbitrary. Perigord (1996) assumed for France that the closed landscapes feature the degree of obstruction between 40 and 70% and more 70% totality closed.

## Conclusions and summary

The method here proposed allows for the assessment of the continuous variability of landscapes, expressing the gradient from open to closed landscapes. The respective indicator has a simplified character – the diversity of the relief was accounted for in a limited degree, so that it would have to be complemented for the mountainous countries.

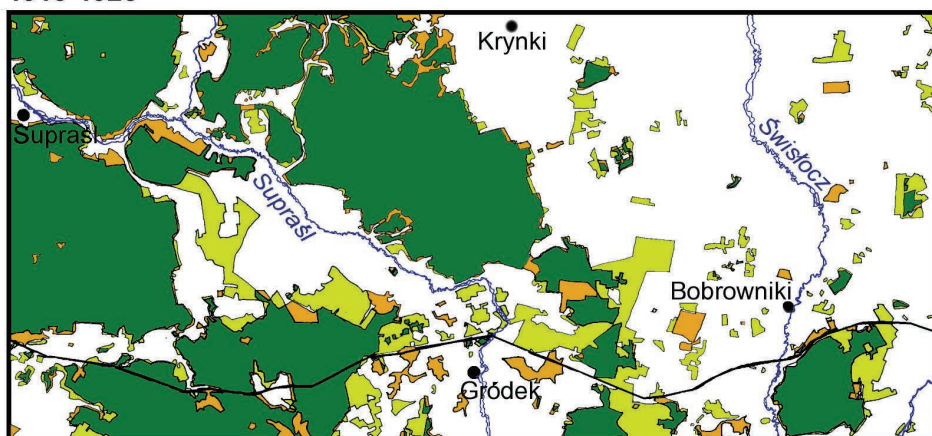
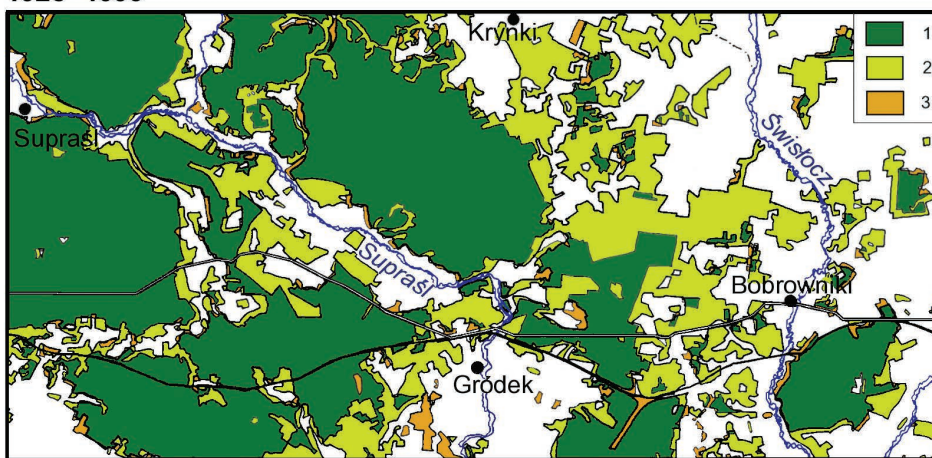
Although the calculations were performed as estimates, the image obtained is quite detailed and precise. The resulting map provides new information on cultural landscapes of Poland. As we compare the fragment of the map, concerning Poland, with the one, elaborated by Meeus (1993, 1995), and accounting for the wide disparity of the respective scales, we can state that the image of the territory of Poland differs very significantly. The present study corrects the errors concerning the distribution and classification of landscapes, appearing in the elaborates here quoted.

The degree of openness / closure of landscapes changed over centuries. The dynamics of this process is different in various parts of the country. Figure 2 shows a stage in the development of landscapes – a static image that is valid for approximately 30 years. In the historical times the process of opening up / closing of landscapes on the Polish lands was not unidirectional. Numerous wars and elementary catastrophes (especially epidemics) brought large losses in terms of population numbers, depopulation of significant territories, abandonment of business, and,

consequently, regeneration of forests through natural succession. The most important reversals of the trend took place after the Tartar invasions in the 12th century (in the regions of Małopolska and the Silesian Lowland), in the 17th century after the Thirty Years War (in northern and western Poland), and after the Swedish wars – on almost entire territory of the country.

In the course of historical events, some of the Polish regions, previously densely populated and agriculturally developed, were resettled or abandoned by the inhabitants. The ancient cultural landscape was covered up by the vegetation (like, e.g. in Bieszczady Mts., Lower Beskid Mts., the Region of Przemyśl, and in Sudety Mts.). Similar processes are taking place nowadays in the counties of eastern Poland, from where young people migrate to towns, older people die out, and entire villages get empty. Open landscapes become closed, as forests grow (Fig. 3). The opposite process is being also observed. Large cities, due to their economic attractiveness and the labour market, attract new inhabitants (like Warsaw, Kraków, Poznań or Wrocław).

The process of closing of the landscapes is being accelerated also due to activities resulting from nature protection and legal limitations to tree cutting (Kistowski 2010; Lewandowski 2010). The basically justified idea is sometimes deformed by the improper understanding of the purposes of protection. Abandonment of sheep pasturing on mountain meadows causes their overgrowing with bushes and trees. Similarly, limitation of cattle husbandry over Biebrza river brings in effect overgrowing of the wetlands. Finally, the uncontrolled regeneration of beech in the Ojców National Park obstructs the view on rocks and xerothermic swards. In this manner not only the reach of the closed landscapes gets extended, but also the specificity, biodiversity, and in some cases quite unique character of the cultural landscapes of Poland are lost. Protection of the cultural landscape ought to account, as well, for the needs of exposing the traditional forms of land use.

**1915-1928****1928 - 1993**

0 5 10 km

**Figure 3.** Changing of forest area in 20th century in Knyszyńska Forest. 1 – Stable forest area; 2 – New forest; 3 – Clearing

Contemporary protection of landscape – both the natural and the cultural ones – requires constant awareness as to the degree and character of human intervention. As we care for the nature that is specific for Poland, we should by all means control the excessive closing of the landscapes. Current experience in the domains of modern town planning and architectural design, as well as the interdisciplinary knowledge of the directions of nature protection may be helpful in the integrated management of landscape. This is an obli-

gation resulting not only from the fact that Poland joined the European Landscape Convention, but also from the care for the quality of life of the future generations.

Editors' note:

Unless otherwise stated, the sources of tables and figures are the authors', on the basis of their own research.

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